

## Claims

- [c1] 1. A weld wire comprising:  
a sheath encapsulating a metal core made of powdered metal, wherein a fill percentage of the metal core is higher than approximately 12%; and  
the metal core having a core composition alloyed with an alloying element or an combination of elements comprising Cr, Mo, V, W, Hf and Nb or combinations thereof, wherein a total weight percentage of the alloying element or the combination of elements in the core composition does not exceed approximately 1%.
- [c2] 2. The weld wire of Claim 1, wherein the alloying element is Mo in the amounts selected from the range of about 0 to about 0.5 percent by weight.
- [c3] 3. The weld wire of Claim 1, wherein the fill percentage of the metal core is selected from the range of about 12% to about 30 %.
- [c4] 4. The weld wire of Claim 1, wherein the total percentage of the combination of elements is selected from the range of about 0.4% to about 0.8%.
- [c5] 5. The weld wire of Claim 1, wherein the composition mainly comprises, approximately,  

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C 0.021-0.043%,  
Mn 1.0-1.69.0%,  
Si 0.33-0.66%, and  
Ni 0.016-0.033%  

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and the fill percentage of the metal core is higher than approximately 12%.
- [c6] 6. The weld wire of Claim 1, wherein the alloying combination comprises, approximately,  
Cr Up to 0.5  
Mo Up to 0.5  
W Up to 0.5

V Up to 0.5

Hf Up to 0.5

Nb Up to 0.5.

- [c7] 7. An improved productivity weld wire comprising  
a sheath encapsulating a steel core having a core fill percent of more than 12%;  
and  
the steel core having a composition comprising an alloying element selected from  
the group consisting of Cr, Mo, V, W, Hf and Nb and combinations thereof,  
wherein a deposition rate of the weld wire when used during welding increases  
with the increase of the core fill percent.
- [c8] 8. The improved productivity weld wire of Claim 7, wherein the deposition rate  
increases from about 15 lb/hr for the core fill percent of about 12% to the  
deposition rate of about 20 lb/h for the core fill percent of about 30%.
- [c9] 9. The improved productivity weld wire of Claim 7, wherein a total weight  
percentage of an alloying element does not exceed approximately 1%.
- [c10] 10. The improved productivity weld wire of Claim 8, wherein a total weight  
percentage of Mo varies from about 0% to about 0.4%.
- [c11] 11. The improved productivity weld wire of Claim 7, wherein the steel core is  
made of a compacted metal powder.
- [c12] 12. An improved productivity weld wire comprising:  
a sheath encapsulating a metal core, wherein a core fill percent of the metal  
core is higher than 12%; and  
the metal core having a composition alloyed with an alloying element or an  
combination of elements comprising Cr, Mo, V, W, Hf and Nb or  
combinations thereof, wherein a total weight percentage of the alloying  
element or the combination of elements in the core composition does not  
exceed approximately 1%, and wherein a travel speed of the weld wire when

used in welding ranges from about 65 in/min to about 145 in/min.

- [c13] 13. The improved productivity weld wire of Claim 12, wherein the travel speed of the wire when used in welding is a maximum travel speed ranging from about 80 in/min to about 145 in/min for the core fill percent ranging from about 12% to about 30 %.
- [c14] 14. The improved productivity weld wire of Claim 12, wherein the travel speed of the wire when used in welding increases from about 65 in/min to about 90 in/min.
- [c15] 15. The improved productivity weld wire of Claim 13, wherein the maximum travel speed of the wire when used in welding corresponds to the composition comprising a percentage of Mo ranging from about 0% to about 0.4%.
- [c16] 16. A method of manufacturing a weld wire comprising:  
forming a sheath into a shape which can be filled with a metal powder;  
filling the sheath with the metal powder, the metal powder having a composition alloyed with an alloying element or a combination of elements comprising Cr, Mo, V, W, Hf and Nb or combinations thereof, wherein a total weight percentage of the alloying element or the combination of elements in the core composition does not exceed approximately 1%;  
compacting the metal powder to form a metal core; and  
drawing the wire to achieve a core fill percentage of the metal core no less than 12%.
- [c17] 17. The method of Claim 16, wherein the core fill percentage ranges from about 12% to about 30%.
- [c18] 18. The method of Claim 17, wherein the alloying element is Mo and wherein the total weight percentage of Mo ranges from about 0% to about 0.4 %.

[c19] 19. The method of Claim 16, wherein the total weight percentage of the combination ranges from about 0.4% to about 0.8%.

[c20] 20. The method of Claim 16, wherein the alloying combination comprises, approximately,

Cr - Up to 0.5

Mo - Up to 0.5

W - Up to 0.5

V - Up to 0.5

Hf - Up to 0.5

Nb - Up to 0.5.